

WHAT IS CLAIMED IS:

1. An image pickup device comprising:

a solid-state imaging element;

5 driving means for driving said solid-state imaging element;

overflow level setting means for controlling a substrate bias voltage of said solid-state imaging element in order to variably set an overflow level of a charge accumulating portion of the solid-state imaging element, the overflow level being determined according to the substrate bias voltage; and

10 reading control means capable of reading pixel charges as an output signal by means of said driving means in a normal driving mode in which individual pixel charges of said solid-state imaging element are read separately or in an n-addition driving mode in which a specific number "n" of pixel charges in the vertical direction of said solid-state imaging element are added and then read, wherein

20 said overflow level setting means controls said substrate bias voltage to a different value, depending on whether the reading control means reads the pixel charges in said normal driving mode or in said n-addition driving mode.

25 2. The image pickup device according to claim 1, wherein said overflow level setting means controls said substrate bias voltage based on a relationship between

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the overflow level of the charge accumulating portion and a saturated level of a horizontal transfer path included in said solid-state imaging element.

3. The image pickup device according to claim 1,  
5 further comprising storage means in which adjustment information about said substrate bias voltage in said n-addition driving mode created based on a measured value of the relationship between the overflow level of  
10 said charge accumulating portion of said solid-state imaging element and the substrate bias voltage is stored beforehand, and wherein

said overflow level setting means controls said substrate bias voltage in said n-addition driving mode based on the adjustment information in said storage  
15 means.

4. An image pickup device comprising:  
a solid-state imaging element;  
driving means for driving said solid-state imaging  
element;

20 overflow level setting means for controlling a substrate bias voltage of said solid-state imaging element in order to variably set an overflow level of a charge accumulating portion of the solid-state imaging element, the overflow level being determined according  
25 to the substrate bias voltage; and

reading control means capable of reading pixel charges as an output signal by means of said driving

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means in an n-addition driving mode in which a specific number "n" of pixel charges in a vertical direction of said solid-state imaging element are added and then read, wherein

5           said overflow level setting means controls said substrate bias voltage to a different value according to the value of "n" in the n-addition driving mode by said reading control means.

10           5. The image pickup device according to claim 4, wherein said overflow level setting means controls said substrate bias voltage based on a relationship between the overflow level of the charge accumulating portion and a saturated level of a horizontal transfer path included in said solid-state imaging element.

15           6. The image pickup device according to claim 4, further comprising storage means in which adjustment information about said substrate bias voltage in said n-addition driving mode created based on a measured value of the relationship between the overflow level of  
20           said charge accumulating portion of said solid-state imaging element and the substrate bias voltage is stored beforehand, and wherein

            said overflow level setting means controls said substrate bias voltage in said n-addition driving mode  
25           based on the adjustment information in said storage means.

7. A driving device of a solid-state imaging

device comprising:

a driving unit configured to drive the solid-state imaging device in either an addition driving mode in which a plurality of pixels are added and read as a single pixel or a non-addition driving mode; and

a substrate bias voltage supply configured to apply a bias voltage to a substrate of the solid-state imaging device according to a driving mode.

8. The driving device according to claim 7, wherein said substrate bias voltage supply applies a different bias voltage in the addition driving mode from that in the non-addition driving mode.

9. The driving device according to claim 7, wherein said substrate bias voltage supply, in the addition driving mode, applies a different bias voltage to the solid-state imaging device according to the number of pixels added by said driving unit.

10. The driving device according to claim 7, wherein said driving unit, in the addition driving mode, supplies to the solid-state imaging device such a driving pulse as adds a specific number ( $n$ : an integer equal to or larger than 2) of pixel charges in a vertical direction of said solid-state imaging device and reads a result of addition.

11. A driving device of a solid-state imaging device comprising:

a driving unit configured to drive the solid-state

imaging device in an addition driving mode in which a plurality of pixels are added and read as a single pixel; and

5 a substrate bias voltage supply configured to apply a bias voltage to a substrate of the solid-state imaging device according to the number of pixels added by said driving unit.

10 12. The driving device according to claim 11, wherein said driving unit supplies to the solid-state imaging device such a driving pulse as adds a specific number (n: an integer equal to or larger than 2) of pixel charges in a vertical direction of the solid-state imaging device and reads a result of addition.

15 13. An image pickup device comprising:  
a solid-state imaging element;  
driving means for driving said solid-state imaging element;

20 substrate bias setting means for variably setting the substrate bias voltage of said solid-state imaging element; and

color correction means for subjecting an output of said solid-state imaging device to a color correction process according to said substrate bias voltage.

25 14. The image pickup device according to claim 13, wherein said color correction means subjects the output of said solid-state imaging element to a white balance adjustment process.

15. The image pickup device according to claim 13,  
further comprising reading control means capable of  
reading pixel charges as an output signal by means of  
said driving means in a normal driving mode in which  
5 individual pixel charges of said solid-state imaging  
element are read separately or in an n-addition driving  
mode in which a specific number "n" of pixel charges in  
a vertical direction of said solid-state imaging  
element are added and then read, and wherein

10 said substrate bias setting means controls said  
substrate bias voltage to a different value, depending  
on whether the reading control means reads pixel  
charges in said normal driving mode or in said n-  
addition driving mode.

15 16. The image pickup device according to claim 13,  
further comprising reading control means capable of  
reading pixel charges as an output signal by means of  
said driving means in an n-addition driving mode in  
which a specific number "n" of pixel charges in a  
20 vertical direction of said solid-state imaging element  
are added and then read, and wherein

said substrate bias setting means controls said  
substrate bias voltage to a different value according  
to the value of "n" in the n-addition driving mode by  
25 said reading control means.

17. A driving device of a solid-state imaging  
device comprising:

a driving unit configured to drive the solid-state imaging device in either an addition driving mode in which a plurality of pixels are added and read as a single pixel or a non-addition driving mode;

5       a substrate bias voltage supply configured to apply a bias voltage to a substrate of the solid-state imaging device according to the driving mode; and

10       an amplifier configured to adjust a gain of an output of said solid-state imaging element according to said substrate bias voltage.

15       18. The driving device according to claim 17, wherein said amplifier adjusts a relative gain between individual color components of the output of said solid-state imaging element according to said substrate bias voltage.

19. The driving device according to claim 17, wherein said amplifier adjusts an absolute value of the output of said solid-state imaging element according to said substrate bias voltage.

20       20. The driving device according to claim 17, wherein said amplifier adjusts not only a relative gain between individual color components of the output of said solid-state imaging element but also an absolute value of the output of said solid-state imaging element according to said substrate bias voltage.

25       21. A method of driving a solid-state imaging device comprising:

driving the solid-state imaging device in either an addition driving mode in which a plurality of pixels are added and read as a single pixel or a non-addition driving mode; and

5           applying a bias voltage to a substrate of the solid-state imaging device according to a driving mode.

22. The method according to claim 21, wherein said bias voltage in the addition driving mode differs from that in the non-addition driving mode.

10           23. The method according to claim 21, wherein said bias voltage, in the addition driving mode, varies according to the number of pixels added in the addition driving mode.

15           24. The method according to claim 21, further comprising making a color correction according to the bias voltage.

25           25. The method according to claim 24, wherein said color correction varies a white balance adjustment value according to the bias voltage.

20           26. The method according to claim 24, wherein said color correction varies a luminance according to the bias voltage.

27. An image pickup device comprising:

          a solid-state imaging element;

25           driving means for driving said solid-state imaging device;

          substrate bias setting means for variably setting

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a substrate bias voltage of said solid-state imaging element; and

gain correction means for correcting a gain of an  
output of said solid-state imaging element according to  
5 said substrate bias voltage.

28. The image pickup device according to claim 27, wherein said gain correction means subjects the output of said solid-state imaging element to a white balance adjustment process.

10           29. The image pickup device according to claim 27,  
wherein said gain correction means adjusts a  
sensitivity of the output of said solid-state imaging  
element.